REMARKS

The Applicants respectfully appreciate the thorough examination of the present application as evidenced by the Office Actions of September 21, 2004, January 11, 2005, and February 24, 2005. In response, the Applicants have amended Claim 45 to include all recitations of Claims 49, 50, 54, 55, and 56; amended Claim 47 to include all recitations of Claims 45, 49, 55, and 56; canceled Claims 49, 55, and 56; amended Claim 50 to depend from Claim 47 and to address a minor informality noted therein; and added new dependent Claims 98-103. The Applicants will also show that all pending claims are patentable for at least the reasons discussed below. Accordingly, the Applicants respectfully submit that all claims are in condition for allowance, and a notice of allowance is thus respectfully requested in due course.

All Rejections Under 35 U.S.C. Sec. 112 Have Been Addressed

Claims 51 and 54 have been rejected under 35 U.S.C. Sec. 112, second paragraph as being indefinite. With respect to Claim 51, the Office Action states that there is insufficient antecedent basis for the term "the seed layer". In response, Claim 50 has been amended to recite "a seed layer" so that proper antecedent basis is provided for the term "the seed layer" in Claim 51. With respect to Claim 54, the Office Action states that there is insufficient antecedent basis for the term "the conductive barrier layer". In response, Claim 47 has been amended to recite the term "a conductive barrier layer" so that proper antecedent basis is provided for the term "the conductive barrier layer" in Claim 54. Accordingly, all rejections under 35 U.S.C. Sec. 112 have been overcome.

Claim 45 Is Patentable Over The Cited Art

As discussed above, Claim 45 has been amended to include the recitations of previously pending Claims 45, 49, 50, 54, 55, and 56, and each of these previously pending claims has been rejected under 35 U.S.C. Sec. 102(e) as being anticipated by U.S. Patent No. 6,853,076 to Datta et al. (hereinafter "Datta"). The Applicants respectfully submit that Claim 45 is patentable as amended for at least the reasons discussed below. In particular, Claim 45 (as amended) recites an electronic structure including:

a conductive pad on a substrate;

an insulating layer on the substrate and on the conductive pad, the insulating layer having a via therein so that a portion of the conductive pad opposite the substrate is free of the insulating layer;

a seed layer on the portion of the conductive pad free of the insulating layer, on sidewalls of the via, and on a surface of the insulating layer opposite the substrate;

a conductive shunt layer on the portion of the conductive pad free of the insulating layer, on sidewalls of the via, and on surface portions of the insulating layer surrounding the via opposite the substrate and the conductive pad, wherein the conductive shunt layer has a thickness of at least approximately 0.5μm and wherein the conductive shunt layer comprises copper and wherein the seed layer is between the conductive shunt layer and the insulating layer and between the conductive shunt layer and the conductive pad;

a conductive barrier layer on the conductive shunt layer wherein the conductive barrier layer comprises at least one of nickel, platinum, palladium, and/or combinations thereof; and

a solder layer on the conductive barrier layer wherein the conductive shunt layer and the solder layer comprise different materials, wherein the conductive barrier layer is between the conductive shunt layer and the solder layer, wherein the conductive shunt layer, the conductive barrier layer, and the solder layer are on portions of the seed layer, and wherein portions of the seed layer are free of the conductive shunt layer, the conductive barrier layer, and the solder layer. (Underline added.)

Datta fails to teach or suggest a conductive barrier layer and a conductive shunt layer between a solder layer and a seed layer wherein portions of the seed layer are free of the conductive shunt layer, the conductive barrier layer, and the solder layer. In support of the rejection, the Office Action states that:

> Datta further discloses wherein the conductive shunt layer (28), the conductive barrier layer (30), and the solder layer (38) are on portions of the seed layer (26), and wherein portions of the seed layer are free of the conductive shunt layer, the conductive barrier layer, and the solder layer (Fig. 9).

Office Action, page 5. The Applicants respectfully disagree with this interpretation of Datta. In particular, Figure 9 of Datta shows that the metal layers 26, 28, and 30 are removed substantially everywhere except directly under the under the solder (34, 38). With respect to Figure 8, Datta states that:

> Removal of lateral portions of the three metal layers 26-30 may be carried out by a wet etch that is substantially selective to the electrically conductive bump precursor button 34, and to patterned passivation layer 20 and patterned nitride layer 18.

Datta, col. 5, lines 53-57. Accordingly, Data fails to teach or suggest a conductive barrier layer and a conductive shunt layer between a solder layer and a seed layer wherein portions of the seed layer are free of the conductive shunt layer, the conductive barrier layer, and the solder layer.

The Applicants thus submit that Claim 45 is patentable over the cited art. In addition, Claim 54 is patentable over the cited art for reasons similar to those discussed above with regard to Claim 45. Moreover, Dependent Claims 46, 48, 57, 94, 97, and 98-101 are patentable at least as per the patentability of Claim 45 from which they depend.

Claim 47 Is Patentable Over The Cited Art

As discussed above, Claim 47 has been amended to include the recitations of previously pending Claims 45, 47, 49, 55, and 56, and each of these previously pending claims has been rejected under 35 U.S.C. Sec. 102(e) as being anticipated by U.S. Patent No. 6,853,076 to Datta et al. (hereinafter "Datta"). The Applicants respectfully submit that Claim 47 is patentable as amended for at least the reasons discussed below. In particular, Claim 47 (as amended) recites an electronic structure including:

> a conductive pad on a substrate;
> an insulating layer on the substrate and on the conductive pad, the insulating layer having a via therein so that a portion of the conductive pad opposite the substrate is free of the insulating layer;
> a conductive shunt layer on the portion of the conductive pad free of the insulating layer, on sidewalls of the via, and on surface portions of the insulating layer surrounding the via opposite the substrate and the conductive pad, wherein the conductive shunt layer has a thickness of at least approximately 1.0μm and wherein the conductive shunt layer comprises copper;
> a conductive barrier layer on the conductive shunt layer wherein the conductive barrier layer comprises at least one of nickel, platinum, palladium, and/or combinations thereof; and
> a solder layer on the conductive barrier layer, wherein the conductive shunt layer and the solder layer comprise different materials and wherein the conductive barrier layer is between the conductive shunt layer and the solder layer.

Datta fails to teach or suggest a conductive barrier layer including at least one of nickel, platinum, palladium, and/or combinations thereof between a conductive shunt layer comprising copper and a solder layer, wherein the conductive shunt layer has a thickness of at least 1.0 μm.

It will be understood that the recitation "at least one of nickel, platinum, palladium, and/or combinations thereof" means one of these materials or combinations of two or more of these materials. As discussed with respect to Figures 3-9 of Datta, the metal first layer 26 is titanium, chromium, tungsten, or titanium-tungsten formed to a thickness in the range of about 500 Angstroms to about 4000 Angstroms (0.05 to 0.4 μm), and preferably about 2000 Angstroms (0.2 μm). (*See*, Datta, col. 3, lines 39-55.) Moreover, the metal second layer 28 is sputtered copper having a thickness in a range from about 1000 Angstroms to about 5000 Angstroms (0.1 to 0.5 μm), preferably from about 1500 Angstroms to about 4000 Angstroms (0.15 to 0.4 μm), and more preferably about 2000 Angstroms (0.2 μm). (*See*, Datta, col. 3, lines 59-65). Finally, the metal third layer 30 is a NiV alloy or vanadium-doped nickel layer. (*See*, Datta, col. 4, lines 26-29.) Accordingly, Datta fails to teach or suggest a conductive shunt layer comprising copper and having a thickness of at least 1.0 μm and a conductive barrier layer comprising at least one of nickel, platinum, palladium, and/or combinations thereof between the conductive shunt layer and a solder layer.

The Applicants thus submit that Claim 47 is patentable over the cited art. In addition, Claims 48 and 101 are patentable over the cited art for reasons similar to those discussed above with regard to Claim 47. Moreover, Dependent Claims 50-54, 102, and 103 are patentable at least as per the patentability of Claim 47 from which they depend.

CONCLUSION

Accordingly, the Applicants submit that all pending claims in the present application are in condition for allowance, and a Notice of Allowance is respectfully requested in due course. The Examiner is encouraged to contact the undersigned attorney by telephone should any additional issues need to be addressed.

Respectfully submitted,

Scott C. Hatfield
Registration No. 38,176

Customer Number 20792
Myers Bigel Sibley & Sajovec, P.A.
P.O. Box 37428
Raleigh, NC 27627
919-854-1400
919-854-1401 (Fax)

CERTIFICATE OF FACSIMILE TRANSMISSION

Date of Deposit: May 12, 2005

I hereby certify that this correspondence is being facsimile transmitted to the United States Patent and Trademark Office to (703) 872-9306 on the date indicated above and is addressed to: MAIL STOP AMENDMENT, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Joyce Paoli